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September 30, 2015

Via Overnight Federal Express

Shawn M. Garvin
Regional Administrator
United States Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Re: Bloom Energy

Dear Mr. Garvin:

This letter addresses the points raised in your September 8, 2015 letter to Secretary Small of the Delaware Department of Natural Resources and Environmental Control (DNREC). Your letter indicated that, based on EPA's review of the materials provided to DNREC by Bloom Energy, EPA does not agree with DNREC's conclusion that Bloom Energy's desulfurization canister units (Desulf Units) fall within the Manufacturing Process Unit (MPU) exemption to RCRA's hazardous waste regulations.[1] For the reasons described in Bloom's letter to DNREC and for the *additional* reasons identified in this letter, Bloom believes that the MPU exemption does apply to the manufacturing units described below, and that Secretary Small's interpretation and decision were correct. Bloom's manufacturing process uses a new technology that has not previously been considered by EPA, but that clearly fits into the MPU definition and, in particular, its purpose. Bloom respectfully requests that EPA reconsider its interpretation, taking into account the new information and the practices implemented by Bloom subsequent to its correspondence with DNREC, both of which are described herein.

As you know, the MPU exemption provides that waste generated "***in a manufacturing process unit … is not subject to regulation [as a hazardous waste] until it exits the unit in which it was generated….unless the hazardous waste remains in the unit more than 90***

[1] Bloom's March 12, 2015 letter to Secretary Small and Secretary Small's June 3, 2015 response are enclosed for your convenience (enclosures omitted).

days after the unit ceases to be operated for manufacturing. . . ." 40 CFR 261.4(c) (emphasis added). The Preamble accompanying adoption of the MPU exemption explains that "the rationale for exempting hazardous waste from regulation while it remains in the unit within which it was generated is that ***the unit will have structural integrity against releases*** *and will be operated to prevent such releases."* 45 Fed. Reg. 72025 (emphasis added). The Preamble specifically anticipates exactly the situation Bloom presents when it explains that the MPU exemption is needed because such units are "occasionally taken out of operation for temporary periods … for maintenance or repair…." *Id*.

The Bloom Desulf Units fall squarely within the plain language of the exemption: they have structural integrity and are operated to prevent releases. And the maintenance activities Bloom undertakes fall squarely within the Preamble language. Nevertheless, we understand the caution with which EPA approaches the unique circumstances presented by this new technology; the purpose of this letter, therefore, is to provide you, as well as Secretary Small, with additional information, including significant actions that Bloom has taken as a direct result of its conversations with DNREC. These actions further support the application of the MPU exemption to Bloom's Desulf Units and the unusual extent to which these Units satisfy the rationale laid out in the Preamble.

In particular, to address some of the initial concerns raised by DNREC (as well as in your letter), Bloom has taken the following steps: (1) Bloom has created and implemented a Desulf Unit Tracking System which will guarantee that Bloom (and any regulatory agency requesting the information) will at all times know the location of each Desulf Unit, and be able to demonstrate that it is being handled to meet the 90-day MPU requirement. As a result, the information immediately available to Bloom and to environmental regulators, will exceed the information that would be available were the Units managed as hazardous wastes before they are opened, and were they subject to RCRA manifest requirements; and (2) Bloom has obtained Department of Transportation (DOT) certification of all of its Desulf Units for hazardous materials shipping, thereby assuring that the Desulf Units themselves have structural integrity that meets or exceeds the integrity of containers required for shipping hazardous wastes.

These steps were taken by Bloom Energy despite DNREC's conclusion that its waste management process complies with hazardous waste laws, because Bloom wished to address the concerns expressed by DNREC, regardless of whether such steps are required for RCRA compliance.

Based on your letter, it appears that EPA shares some of the same concerns initially raised by DNREC—namely, that the lack of a manifest requirement means that there will not be "continuous and controlled oversight during transport." Bloom believes that its recent actions, described in additional detail below, should allay these concerns and demonstrate

that Bloom has gone beyond the requirements imposed on hazardous waste transportation by implementing a robust and complete tracking system for continuous and controlled oversight of the Desulf Units from the moment that they are taken out of service. In addition, DOT certification confirms that the Desulf Units' filter contents are transported in containers that satisfy RCRA's requirements, ensuring that transportation of the Desulf Units to the licensed transfer facility where the Units are first opened will pose no undue risk of a release. The DOT certification underscores the fact that the Desulf Units are distinguishable from disassembled heat exchangers shipped off-site for cleaning, which prior EPA guidance has suggested makes disassembled heat exchangers ineligible for the MPU exemption.

Finally, we believe that the tracking system and the DOT certification make the management of Bloom's Desulf Units virtually unique among manufacturing process units in the rigor with which they are tracked and the safety of their transportation as they move from the point of operation to the point at which they are opened. For these reasons, in addition to the reasons enumerated in Bloom's March 12, 2015 letter to DNREC and the additional reasons detailed in this letter, Bloom believes that DNREC's initial determination was correct and is now even more strongly supported than at the time of its issuance. The Bloom Desulf Units fully satisfy the language and the purpose of the RCRA MPU exemption.

I. Brief Overview of the Issue.

The Bloom process for efficient, clean production of electricity has been extensively described in Bloom's letter to Secretary Small and will not be repeated here except in the most summary manner.

Bloom manufactures electricity in Servers which use an innovative solid oxide fuel cell technology, created by Bloom's founder and his scientific colleagues in the first decade of this century, to convert natural gas or biogas into electricity through a combustion-free electrochemical reaction. The natural gas is piped into the server from the local utility, processed in the server, and electricity is produced. The result is among the most efficient forms of electricity generation available, with significantly reduced greenhouse gas emissions and virtual elimination of criteria pollutants. The process uses no water in operation, makes virtually no noise, and its visual footprint is minimal—the size of a parking space.

As described at greater length in Bloom's DNREC submission, the first step in the process of generating electricity is removal of sulfur compounds from the natural gas by passing the gas through filter material contained in the Desulf Unit. In the course of this activity, a small residue of benzene, which is present in natural gas, is deposited on the filter. As the filter materials become saturated with sulfur compounds, they begin to lose efficiency. Therefore, the Desulf Units are periodically disconnected and replaced with a Desulf Unit containing

fresh filters. Upon being disconnected, the Desulf Unit automatically seals shut—a feature necessary to assure there is no release of natural gas. The Desulf Unit is then transported to a centralized Texas-based and TCEQ-licensed transfer facility where it is opened, valuable components are reclaimed, and the contents are properly disposed of in accordance with RCRA requirements. The Desulf Units are then cleaned, refilled, and sent back to the field for reuse.

There are two noteworthy aspects of the used filter materials in terms of the issues under discussion. First, the benzene levels in these materials sometimes exceed the RCRA toxicity characteristic levels for benzene, and sometimes they are below those thresholds. Since January 1, 2015, Bloom has tested used filters from Desulf Units removed from service at six locations, including the four Bloom customer sites in Delaware. Filters from four of these sites (including three in Delaware) tested below the RCRA toxicity characteristic for benzene.[2] Second, the filter materials contain not inconsequential amounts of copper which can be, and generally is, reclaimed before the remaining filters are disposed of.

II. Why Hazardous Waste Generator Status Matters.

Bloom's Servers now produce electricity at more than 200 customer sites, ranging from commercial customers (i.e., Apple, eBay and Verizon), utilities (Delmarva Power, Pacific Gas & Electric) and universities (Caltech), to government facilities (New York City Hall, NASA, and strategic Department of Defense facilities). Bloom's customers place significant value on the environmental benefits of these energy systems, including reduced GHG emissions, near-elimination of criteria pollutant emissions, near-elimination of water use, total elimination of wastewater discharges and elimination of standby diesel generators and their harmful exhaust. Customers who install Bloom systems are choosing to do so, at least in part, because they want to reduce their environmental footprint.

Many of Bloom's customers are not themselves hazardous waste generators, and are largely unfamiliar with the detailed and often burdensome requirements imposed on generators.

There are consequences to customers who adopt clean energy technologies being assigned hazardous waste generator status, or to the generation of new or additional hazardous waste on their properties. There are zoning, general plan, or permit conditions for many facilities—particularly those that are not engaged in heavy manufacturing—which limit their right to generate hazardous waste or outright prohibit it. The new interpretation proposed in the September 8 letter would leave these companies in a position where they have no choice

[2] Ironically, the presence of benzene at levels in excess of RCRA toxicity levels is evidence of the integrity of the Desulf Units as compared, for example, to rail cars or distillation columns, in which low levels of benzene would typically off-gas over the course of the time between being taken out of service and being cleaned.

but to abandon this clean technology alternative and be forced to turn to diesel power generators or to other traditional sources of electricity in order not to violate their land use permits or other siting limitations.

The fact that a majority of the Desulf Units tested are below RCRA hazard levels means that the proposed interpretation would present these customers (and Bloom) with another Hobson's choice. Choice 1 is to open the Desulf Units at the facility, test them, and then ship the contents off site according to whether they do or do not test hazardous. This would: (a) create the potential for air emissions from the contents when the Units are opened and materials removed for testing; and (b) involve more traffic and industrial activity at the customer sites. The alternative to this unattractive option is choice 2—managing the Desulf Units as hazardous waste from the time they are disconnected, despite the fact that, according to test results, that is more likely than not to be wrong.

Requiring customer sites to assume the status of hazardous waste generators would add no environmental benefit, and may well cause customers to conclude they must disregard the many benefits of clean distributed power generation and opt instead for traditional utility-supplied power.[3] Although the negative environmental impacts to society at large are vastly more significant with traditional power generation, customers would avoid the impact on their facility of being characterized as hazardous waste generators if they made such a choice to stick with grid power, often backed up by diesel generators.

Bloom strongly believes that a regulatory interpretation that encourages, indeed forces, such a decision is not only unprecedented, but is out of step with current technological advances and stated policy objectives, and should be rejected.

III. Bloom's New Desulf Unit Tracking System Provides More Complete Information and Better Control than a Manifest.

At Bloom's meeting with DNREC, staff members expressed concern that, without a manifest, a Unit could be lost or diverted and that better information is available if the Units are shipped with a manifest. However, as EPA explains in the Preamble to the MPU rule, the nature of manufacturing process units provides incentives which assure that such possibilities will not materialize. Further, as Bloom explained in its submission to DNREC, such concerns are unwarranted in Bloom's circumstances because the Desulf Units have structural integrity, their reuse is of critical importance to Bloom's operation, and their contents have

[3] Bloom Energy Servers running on natural gas reduce CO_2 by over 35% compared to the average emissions rate of the grid and 50% compared to the non-baseload and fossil fuel resources they displace. *See* http://www.epa.gov/cleanenergy/documents/egridzips/eGRID_9th_edition_V1-0_year_2010_Summary_Tables.pdf.

value. Nevertheless, Bloom took DNREC's concern to heart and concluded it would take additional precautions, even though they went beyond RCRA requirements. Accordingly, subsequent to Bloom's submission of its letter to DNREC in March, Bloom developed and implemented a Desulf Unit tracking system.

The tracking system works by use of the unique part number and serial number which are on each Desulf Unit. At the time a Desulf Unit is removed from service, Bloom's on-site personnel simultaneously enter this information, along with the date of removal, into the tracking system database. These part and serial numbers are then linked to the tracking number for the Bill of Lading used by the shipping company that transports the Desulf Units to a licensed transfer facility in Texas.

When the Desulf Unit is received at the licensed transfer facility, the serial number, part number and receipt date are entered into the tracking database. The transfer facility subsequently enters the date of opening the Desulf Unit, the date when the filter materials are removed from the Unit, and the date of (and other information relevant to) the transfer of the Desulf Unit contents to the licensed TSDF by manifest, according to RCRA's requirements.

To further enhance the system and remove the possibility of human data entry error inherent in any manifest process, Bloom is working on a system that will utilize a bar code on each Desulf Unit. This will replace manual entry of information, and will allow the information to be entered automatically. It expects to implement the bar code system next year. While this will facilitate the process, the fundamentals will remain the same—Bloom knows, at any moment in time, where each Desulf Unit is located, who has custody of the unit, and relevant dates and deadlines (i.e., when it was taken out of service, picked up, opened, and ultimately when the contents were removed and disposed of or reclaimed).

The Bloom tracking system actually provides more information than would be required by a manifest. Unlike a manifest, which simply requires a general description of the RCRA waste classification, the number of containers and the total weight or volume, the Bloom tracking system actually follows every individual unit, by part and serial number, in every single shipment.

Bloom's system is also superior to the hazardous waste manifest because it sends automatic alerts to key Bloom personnel at three distinct points to assure that both Bloom's internal deadlines and RCRA deadlines for handling the Desulf Units are met. Alerts are issued as follows:

- Alert 1: If a Desulf Unit has been removed from service, does not have an assigned Bill of Lading tracking number, and has not been received at the licensed transfer facility within seven days.

- Alert 2: If a Desulf Unit has been removed from service and has not been received at the licensed transfer facility within 17 days.

- Alert 3: If the Desulf Unit's used filter materials have not been sent to the TSDF within 65 days of removal of the Desulf Unit from service.

As can be seen from the above, Bloom's internal deadlines are stricter than the MPU exemption requires—under the MPU exemption, the Desulf Units must merely be *opened* within 90 days. Bloom's internal goal, which the system is built to meet, is for the filter materials to be sent to the licensed TSDF and the signed manifest returned within 65 days. In any event, the timeline would never exceed 90 days and there will be auditable records to prove it.

The tracking system database will be maintained for at least five years. Moreover, the information it contains will be available to regulators, providing a detailed cradle to grave and cradle to cradle record of the Desulf Units and their contents.

The Bloom Desulf Unit tracking system provides significantly more detail and more robust real-time tracking of the location of the Units than would a manifest.

Imposing a manifest requirement at the moment the Desulf Units are removed from the Servers provides no additional environmental protection. Bloom's interactive tracking system, with alerts and a consolidated database of Desulf Unit information, allows Bloom to know at all times where each Desulf Unit is.

Imposing a manifest requirement on top of this system would add unnecessary costs and could stigmatize Bloom's customers; every one of their addresses would immediately become a hazardous waste generator site simply because they selected a clean energy source. These customers have, as discussed above, affirmatively chosen to invest private capital in environmentally responsible energy sources. Labeling them and/or their facilities as hazardous waste generators with employee training, contingency planning, manifesting and other requirements would be counterproductive, with less information about the location of an individual Desulf Unit than the Bloom tracking system would provide.

IV. DOT Certification of Desulf Units Ensures Safe Transportation at Least Equivalent to That Required for Transportation of Hazardous Wastes.

The Desulf Units have been certified to the standards set by the United Nations and DOT, IATA, ICAO and IMO Hazardous Materials Distribution and Packaging requirements.[4] This

[4] The certifications, issued by SGS North America Inc., a designated DOT certification entity, are enclosed.

certification assures that the Units are secure and have the structural integrity to transport materials safely and without unacceptable risk of a release. The RCRA regulations expressly adopted DOT regulations governing the transportation of hazardous materials in defining shipping container requirements. Thus, DOT certification of the Desulf Units, including their filter material contents, establishes compliance with RCRA's requirements for shipping containment. 40 CFR 263.10(a). In other words, regulating the contents of the Desulf Units from the moment they are taken out of service would produce absolutely no added protection in terms of the integrity and safety of shipping containers—the Desulf Units are themselves RCRA-authorized containers for shipment of hazardous waste.

V. Narrowing the MPU Exemption as EPA has Suggested would be Unprecedented and Inconsistent with Advances in Clean Energy Technology.

A. The MPU Exemption

The MPU exemption provides that waste generated "***in a manufacturing process unit*** … ***is not subject to regulation [as a hazardous waste] until it exits the unit in which it was generated***….unless the hazardous waste remains in the unit more than 90 days after the unit ceases to be operated for manufacturing. . . ." 40 CFR 261.4(c) (emphasis added). The Preamble accompanying adoption of the MPU exemption explains that "the rationale for exempting hazardous waste from regulation while it remains in the unit within which it was generated is that ***the unit will have structural integrity against releases*** *and will be operated to prevent such releases."* 45 Fed. Reg. 72025 (emphasis added).

The Preamble to the rule explained:

> [EPA] recognizes that manufacturing units … are occasionally taken out of operation for temporary periods … [for] business reasons [or] for maintenance or repair…. For both temporary and permanent shutdowns, **the Agency will allow a reasonable time to remove any hazardous wastes that remain in the unit after operation ceases. Given the presumption that the unit has integrity before cessation of operation, the Agency believes that a reasonable time is 90 days....** If hazardous wastes remain in these units more than 90 days after cessation of operation, EPA believes that these wastes should be fully regulated. . . .

Id. (emphasis added). The Preamble does not require maintenance or repair activities to take place on site, nor would such a requirement be consistent with the rationale for the exemption.

The MPU exemption can and does apply even after the unit is taken out of service. The 90-day limitation contained in the regulations themselves and explained in the Preamble would otherwise be redundant and unnecessary.

B. The Desulf Units are MPUs

The Desulf Units satisfy the plain language of the MPU exemption as set forth in 40 CFR 261.4(c). The Desulf Unit makes possible a critical process for manufacturing electricity. In doing so, it also stores for a time a valuable material—natural gas. Small residues of benzene, a component of the natural gas, are deposited in the Desulf Unit as the natural gas passes through—much as sludges or residues may accumulate over time in distillation columns or heat exchangers.

We are unaware of any interpretation of the MPU exemption which makes that exemption unavailable solely because a manufacturing unit has been disconnected from operation. In fact, such a limitation would conflict directly with EPA's stated purpose for the exemption: the fact that manufacturing units "are occasionally taken out of operation for temporary periods … [for] business reasons [or] for maintenance or repair." It would also conflict with EPA's official interpretation of the exemption, quoted above from the Preamble to the Rule, allowing 90 days "to remove any hazardous wastes that remain in the unit after operation ceases." 45 Fed. Reg. 72025 (emphasis added).

The only potentially relevant reference we are aware of is a 1990 RCRA hotline document which concludes that the exemption will not apply to a refinery heat exchanger which is "disassembled" for cleaning off site. RCRA Online Letter, #13374, May 1990. The document sets forth the rationale for concluding that these "disassembled" exchangers are not subject to MPU exemption—loss of structural integrity (which is inevitable if equipment is disassembled), and loss of incentive to maintain integrity or to protect the contents. This makes sense—but it has virtually no similarity to the facts presented by Bloom's Desulf Units.

1. Refinery heat exchangers are generally too large to move without disassembly, which requires pulling the tube array out of the containment shell. While heat exchangers generally cannot be shipped off site without being taken apart, Bloom Desulf Units are transferred intact. Disassembly of the heat exchangers requires disconnecting multiple tubes, which are not sealed, thus creating the potential for a release. When a Desulf Unit is disconnected, it automatically seals shut at the one point of entry and the two points of exit for the natural gas. This tight seal is an essential design element because of the critical importance of assuring there is no potential for natural gas leaks.

2. The Desulf Units are not only intact, they are sealed and have structural integrity equivalent to the containers which would be used to ship hazardous wastes under RCRA, were this required.

3. Bloom has multiple incentives to maintain the integrity of the Desulf Units because their contents have value which is reclaimed. That is not true of heat exchanger tubes.

4. Bloom has further incentive to maintain the integrity of the Units—Bloom must reuse the Units and, in use, these Units must hold natural gas in operation of the Servers. As such, it is a commercial necessity for Bloom to assure that these Units are not damaged or otherwise made prone to leakage in the process of disconnection or shipment.[5]

VI. Requiring that Desulf Units Be Managed as RCRA Wastes Before They Are Opened Provides No Environmental Benefit.

There is no difference between the risks posed by transportation of "virgin" Desulf Units and Units destined for maintenance. The Units are completely sealed and intact during both inbound and outbound transportation. The canisters are DOT certified. The Bloom tracking system provides better and more robust protections than a manifest. Imposing hazardous waste requirements on these Units would not change the manner in which they are transported except by requiring a hazardous waste manifest and a licensed hauler, and imposing superfluous training and contingency planning requirements on the host site. In these circumstances, these are distinctions without differences.

The reality is that the Units' contents pose very low risks, if any, to the environment, whether in a sealed or opened container. The benzene that may bring them within the definition of "hazardous" is present solely because it is adsorbed onto the Units' filters. This adsorbed benzene can only be released (such that it could pose a potential risk of actual harm) if the filters are heated to temperatures exceeding 180 degrees Celsius (356° F). So, no environmental risks can occur unless the Unit—which is carefully sealed and subjected to multiple pressure tests upon closure, requires training and specialized equipment to open, and has structural integrity equivalent to hazardous waste transportation packaging—is first opened and then heated to an extremely high temperature.

[5] The specific question and specific facts regarding the refinery heat exchanger, which prompted the RCRA posting, are no longer available in EPA's files. Bloom's counsel therefore engaged in detailed discussions with a company that has, for many years, been a leading provider of off-site servicing of refinery heat exchangers.

VII. Conclusion

Bloom Energy provides electric power with a dramatically reduced environmental footprint as compared to traditional energy sources. In doing so it has made every effort to comply rigorously with all environmental requirements. This is true, as well, of its management of the Desulf Units that are an integral part of its energy production process.

A determination that these Desulf Units must be regulated as hazardous waste from the moment they are taken out of service could have an adverse impact on the environment. By branding every facility that has been willing to invest in this cleaner energy source as the site of hazardous waste generation, or of added hazardous waste, it would potentially jeopardize their land use permits and subject them to additional regulatory requirements. This would discourage the switch from traditional energy sources with no apparent environmental benefit.

Most importantly, however, the EPA (as well as the state of Delaware) has adopted a well-reasoned rule for how potentially hazardous materials in manufacturing process units are to be managed. The rationale for the rule has been laid out in the Preamble, facilitating its interpretation and application. Bloom's Desulf Units fit squarely within the MPU exemption in both RCRA and Delaware law: the Bloom Units satisfy the literal regulatory language of the regulation; they are analogous to examples of MPUs provided by EPA; and application of the MPU exemption to the Desulf Units is entirely in keeping with the intent and the rationale for the exemption. As such, the Desulf Units are not subject to hazardous waste requirements until they are opened, provided that this occurs within 90 days of being taken out of service. The additional steps newly implemented by Bloom as part of its system provide further assurance that the application of the rule will be fully protective of the environment and human health.

Thank you for permitting us the opportunity to present Bloom Energy's position in writing. Bloom requests the opportunity to discuss the contents of this letter with you and, given the national impact of these issues, your colleagues in EPA headquarters. We look forward to those discussions.

Very truly yours,

Michèle B. Corash
Counsel to Bloom Energy

Enclosures

cc: The Honorable David Small (Via FedEx)
Secretary
DNREC

sf-3579764